

Feb. 28, 1961

N. A. MacLEOD

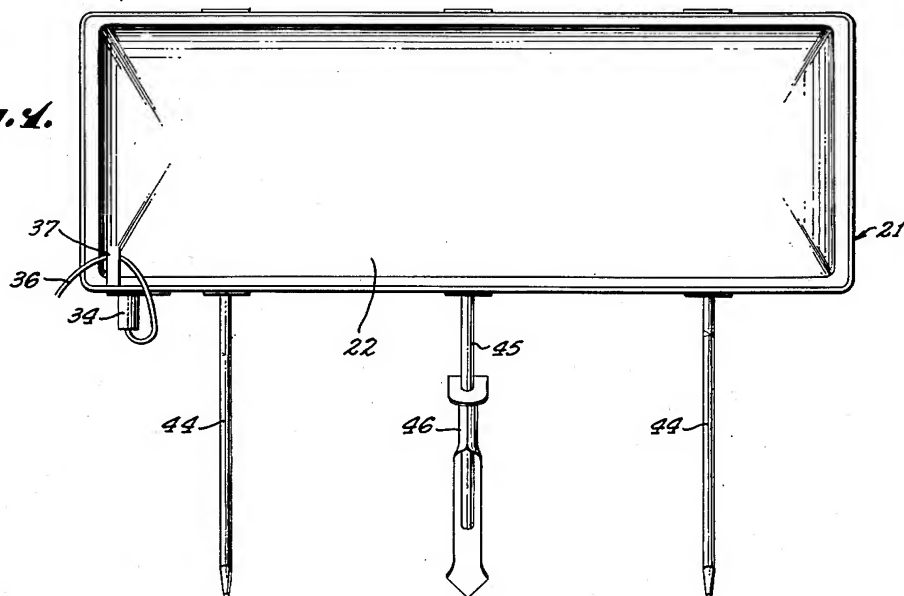
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ANTI-PERSONNEL FRAGMENTATION WEAPON

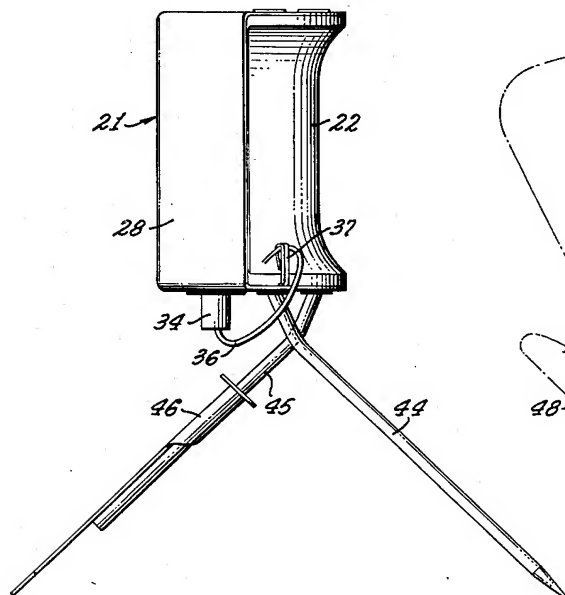
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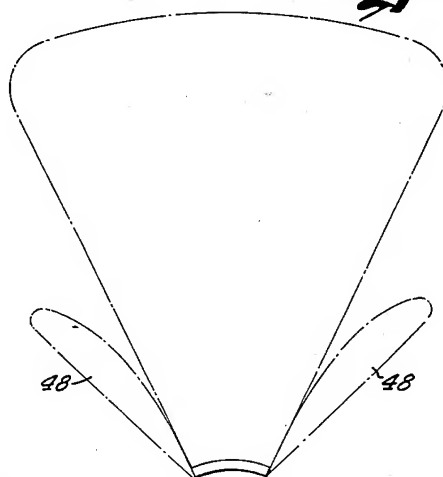
*fig. 1.*



*fig. 2.*



*fig. 3.*



NORMAN A. MAC LEOD,  
INVENTOR.

HUEBNER, BEEHLER,  
WORREL & HERZIG,  
ATTORNEYS.

BY *Warren T. Jessup*

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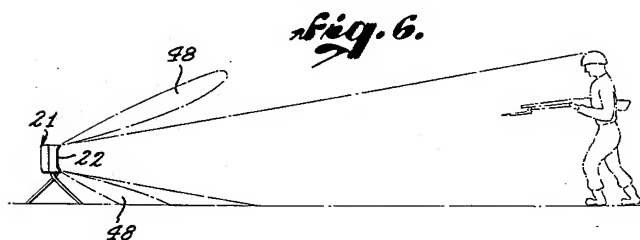
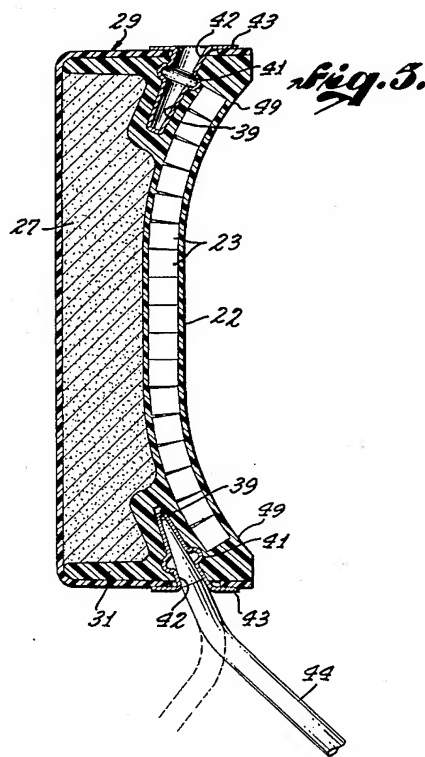
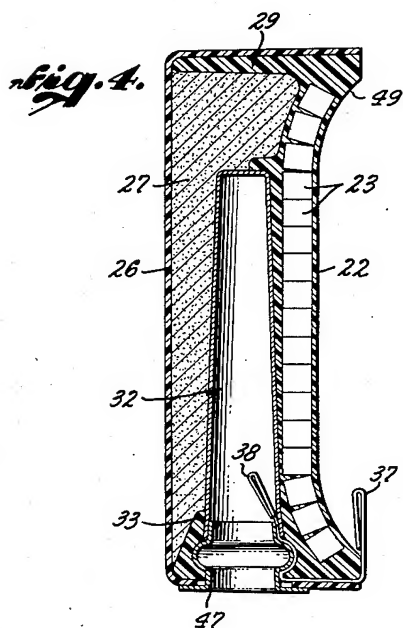
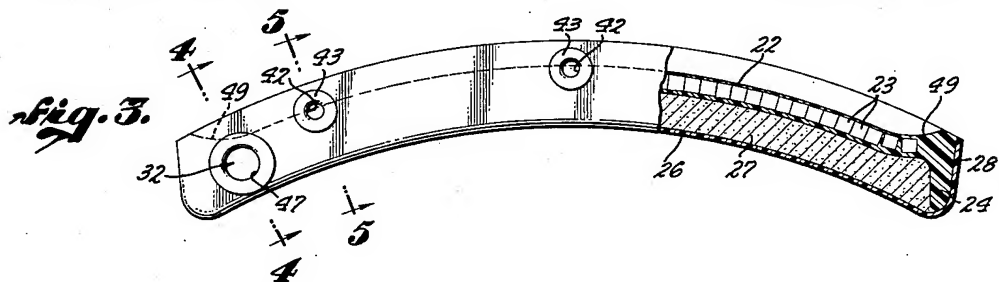
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3 Sheets-Sheet 2



NORMAN A. MAC LEOD,  
INVENTOR.

HUEBNER, BEEHLER,  
WORREL & HERZIG,  
ATTORNEYS.

BY *Warren T. Jessup*

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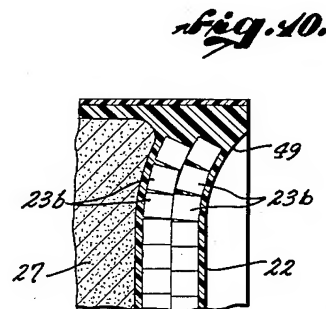
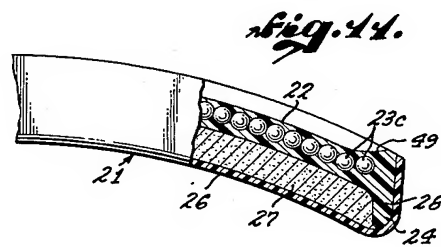
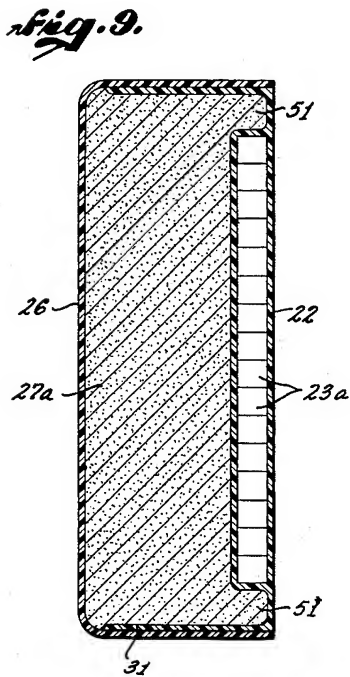
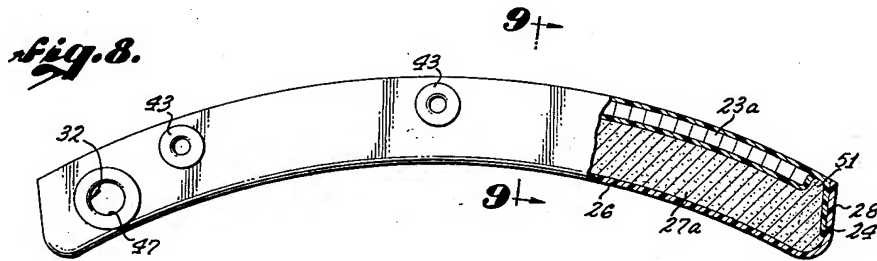
N. A. MacLEOD

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ANTI-PERSONNEL FRAGMENTATION WEAPON

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3 Sheets-Sheet 3



NORMAN A. MAC LEOD,  
INVENTOR.

HUEBNER, BEEHLER,  
WORREL & HERZIG,  
ATTORNEYS.

BY *Warren T. Jessup*

1

2,972,949

## ANTI-PERSONNEL FRAGMENTATION WEAPON

Norman A. MacLeod, Hemet, Calif.  
(1330 N. Fullerton Road, La Habra, Calif.)

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7 Claims. (Cl. 102—67)

This invention relates to anti-personnel fragmentation weapons, and particularly to a defensive weapon against intense infantry attack and for ambush purposes.

It is an object of this invention to provide an anti-personnel fragmentation weapon which may be used in close proximity to the defending users of the weapon and with which the only hazard will be from posterior or lateral blast, which diminishes very rapidly with distance from the weapon.

It is another object of this invention to provide such a weapon as above which will project an intense beam of high velocity fragments substantially parallel to the terrain in the direction of the attacking or advancing enemy infantry.

It is another object of this invention to provide a fragmentation weapon as above wherein the fragmentation beam is in the form of a solid angle preferably having a horizontal aspect of from 45° to 90° and a vertical aspect of from 10° to 30°.

Modern infantry warfare has developed a technique, among certain armies, of sustained mass human attack, with little regard to casualties and of such intensity that traversing fire of defending machine guns cannot cut down all attackers, with the result that sufficient attacking infantry break through the defending lines to overwhelm the defense post. It is an object of this invention to provide a simple, inexpensive, lightweight and easily transportable weapon which can be used to effectively withstand such sustained massive suicidal offensive attacks.

It is another object of this invention to provide an anti-personnel fragmentation weapon which may be readily used with great effectiveness and safety by untrained infantrymen.

It is another object of this invention to provide such a highly effective weapon which is expendable, whereby there is no excess weight which must be maneuvered from place to place as the desirable location for the weapon is changed.

In the placing of defensive machine gun posts, it is always necessary to take into realization the fact that once the weapon has been fired to defend against attackers, its position is known and it will then be subject to shelling and other counter measures. This fact, of necessity, requires periodic movement of location of the machine gun post and strong defensive protection for the machine gun. It is an object of this invention to obviate this shortcoming inherent in defenses provided by machine gun, by providing an anti-personnel fragmentation weapon which is completely expendable and which involves no heavy capital or non-expendable parts that must be moved from place to place as the defense post is changed.

It is another object of this invention to provide such a weapon as above, which may be very small in proportion to its anti-personnel effectiveness, and which is thereby capable of being readily hidden in tall grass and be-

2

hind other natural concealing means, which do not interfere with its effective use.

It is another object of this invention to provide an anti-personnel fragmentation weapon which despite its very effective intensity against onrushing attackers may be effectively aimed to concentrate its beam to an area where a maximum number of useful hits may be obtained.

It is another object of this invention to provide a weapon of such design that the explosive therein is used to the maximum extent in the propulsion of the destructive fragments in the forward direction, thereby minimizing the weight of the explosive required and also improving the security of the defending users of the weapon by minimum damage to the rear of the weapon.

It is another object of this invention to provide such a weapon wherein all of the solid fragmentation particles are directed forwardly toward the enemy, the only rearward and sideward effect being one of blast.

It is a further object of this invention to provide a weapon as above, wherein such blast is rapidly dispersed to the rear, thereby permitting use of the weapon quite close to defending users thereof.

It is another object of this invention to provide such a weapon as above, which will be relatively safe during storage and transport, even in combat areas, from accidental detonation as by impact of bullets, fragments, or otherwise.

It is another object of this invention to provide such a fragmentation weapon as above which, at the limit of lethal velocity of the fragments, there will be an average of at least one fragment in every two square feet of target area, lethal velocity being defined as that velocity of the particular fragment involved which will just produce substantially complete penetration of the human body.

It is another object of this invention to provide a novel method and structure for securing together the front and back members of a housing, in the particular case shown this housing being the housing of a weapon.

It is another object of this invention to provide a novel method of propelling a layer of fragments without requiring employment of bulky, heavy, non-expendable enclosing members.

In accordance with these and other objects which will become apparent hereinafter, preferred forms of the present invention will now be described with reference to the accompanying drawings wherein:

Fig. 1 is a front elevational view of a weapon embodying the present invention;

Fig. 2 is a side elevation of the same;

Fig. 3 is a bottom plan view, partially sectioned, of the weapon;

Figs. 4 and 5 are vertical cross-sections taken on lines 4—4 and 5—5, respectively, in Fig. 3;

Fig. 6 is a somewhat schematic view illustrating the lethal coverage of the weapon in use;

Fig. 7 is a plan view generally similar to Fig. 6 showing the coverage of the weapon in a horizontal plane;

Fig. 8 is a top plan view similar to Fig. 3 illustrating another form of the present invention;

Fig. 9 is a cross-section taken on line 9—9 of Fig. 8;

Fig. 10 is a cross-section similar to Fig. 4, but fragmentary, illustrating another form of the present invention; and

Fig. 11 is a top plan view, similar to Fig. 3, illustrating still another form of the invention.

Referring to the drawings, 21 designates a housing having a front wall 22 made of a relatively light (i.e. low-density), easily frangible material, such as a thermoplastic or thermosetting resin. Looking downward on the apparatus, as in Fig. 3, it will be seen that the front wall 22 is generally convexly cylindrical, with the axis of the cylinder being vertical and disposed appreciably behind

3

the housing 21. As seen in the drawing, the wall subtends an angle of appreciably less than 90°, being in this case about 65°. Embedded within the front wall 22 and substantially covering the face thereof, are a plurality of relatively hard, heavy (i.e., dense or light-density), infrangible elements 23, such as steel cubes, which are packed closely together to form a single layer of elements extending substantially completely over the face of the front wall 22.

Extending rearwardly from the front wall 22, and preferably formed integral therewith, is a peripheral flange 24. In the embodiment shown, the housing 21 is relatively thin and includes a back wall 26 positioned substantially parallel to the front wall 22. The interior of the housing 21, between the front and back walls 22 and 26, respectively, is filled with high explosive 27. Extending forwardly from the rear wall 26 is a peripheral flange 28, within which nests the flange 24 to complete the encasement of the explosive 27. Like the front wall 22, the rear wall 26 is formed of a relatively low-density, easily frangible material such as a thermosetting or thermoplastic resin, and the flange 28 is of similar material, being preferably formed integral with the back wall 26 as shown in Fig. 3.

The housing 21 from a front elevational aspect is preferably rectangular, as shown in Fig. 1, so that the vertical portions of the flanges 24 and 28 constitute side edge walls, as shown in Fig. 3, and the horizontal portions constitute a top edge wall 29 and a bottom edge wall, respectively, as shown in Fig. 5.

Extending vertically into the housing 21 is a tapered well 32 also made of infrangible material similar to the housing walls.

To receive the well 32, the bottom edge wall portion 31 of the flange 24 is thickened as shown at 33, and the inward portion of the front wall 22 is so shaped that the well 32 rests immediately rearwardly and at one side thereof, as shown in Figs. 3 and 4.

The well 32 is adapted to receive a detonator 34, from which extends a fuse 36, which may be electrical or otherwise. The end of the fuse 36 is extended a sufficient distance to the rear or side of the weapon that it may safely be operated by an infantryman at the desired moment. In order to avoid stress on the detonator 34 by undue pulling on the fuse 36, the fuse is run through a clip 37, which is held in place by being pressed between the outer flange 28 and the inner flange 24. If desired, the inner end of the clip member 37 may extend into the well 32, as shown in Fig. 4, and form a spring clip or detent 38 for retaining the detonator 34 in place.

To secure, or assist in securing, the back wall 26 to the front wall 22 and thus enclose the explosive 27, sockets 39 are formed in the front wall 22 including a portion of its flange 24, each socket 39 having an enlarged portion 41 therein. The socket 39 and enlarged portion 41 are preferably circular in cross-section. Extending into the socket 39 is a socket insert or cup 42 having substantially the same size and shape as the socket 39 so as to fit snugly therewithin. While the cup 42 may be formed integral with the outside flange 28, it is preferred to form the cup 42 of a ductile material such as metal, and therefore it is made separate from the flange 28 and provided with an outer flange 43 resting firmly against the flange 28 so as to keep the latter in firm engagement against the flange 24 of the front wall 22.

After the socket insert or cup 42 has been inserted into the socket 39, the portion of the cup 42 opposite the enlargement 41 is pressed outward as by a spinning operation into firm engagement with the enlargement 41, thereby holding the cup 42 firmly in the socket 39, with consequent securement of the back wall 26 to the front wall 22. There are six such securement cups 42, three

4

along the top edge wall 29 and three along the bottom edge wall 31.

The cups 42 form sockets for receiving the pointed ends of supporting legs 44 and 45. Two legs 44 are employed, one at each side of the housing 21 as shown in Fig. 1, extending forwardly as shown in Fig. 2. The leg 45 is located in the center of the housing as shown in Fig. 1, and extends rearwardly. The three legs thus form a tripod mounting for supporting the weapon. As shown in Fig. 2 the rear center leg 45 is preferably provided with a telescoping lower portion 46 so that it may be made adjustable in length in order to tilt the front face of the housing as desired, to aim the weapon. The outer legs are rotatable in their sockets, and being bent, as shown in Fig. 5, can be faced in any direction to achieve maximum stability on any slope of terrain.

The detonator well 32 shown in Fig. 4 is preferably secured in place in a manner similar to that described for the socket inserts 42. The insert 47 thus not only serves to hold the well 32 in place, but also serves as added securement between the front and back members 22 and 26 respectively, of the housing 21.

By providing sockets or cups 42 along the top and bottom edges of the housing 21, the housing may be readily turned over for support, thus placing the detonator well either at the top or bottom, as desired. A second well 32 may also be provided in the top edge of the housing. Such a well serves to receive the trigger end of another fuse, so that a plurality of weapons may be placed side by side, and triggered successively, one from the other.

In order to achieve a proper dispersion pattern in a horizontal plane, as shown in Fig. 7, the housing is given a convex shape shown and described hereinbefore. The elements 23 as noted, are preferably made of steel and are packed close together across the face of the front wall 22 in order to minimize forward escape of high pressure gas resulting from the detonation of the explosive 27. The total weight of the explosive 27 ranges in weight preferably from 20% to 200% of the total weight of the fragments or elements 23.

Unless some provision is made, edge elements 23 tend to be thrown out somewhat laterally to form lateral lobes shown in Fig. 7 at 48. In order to prevent or inhibit this undesired peripheral dispersion, means are provided at the outer extremities of the front wall 22 to overcome the lateral force causing these lobes 48. As shown in Figs. 3 and 4, this means may comprise the formation of the outer extremities of the front wall 22 into a slightly concave configuration as shown at 49. An alternative means for preventing this undue peripheral dispersion is to extend the explosive 27a (Fig. 8) beyond the edge of the fragmentation elements 23a and forwardly therearound as shown at 51 in Figs. 8 and 9.

It will be noted in Fig. 4 that the detonator well 32 is disposed forwardly of at least a major portion of the explosive 27, and preferably, no explosive at all is located in front of the well 32. This is to assure that upon the explosion, the well 32 will be impelled forwardly and not to the rear where it might endanger friendly personnel. For a similar reason the insert cups 42 are also located near the forward face of the housing.

If desired, more than one layer of fragments or elements 23 may be provided, as shown in Fig. 10, where two layers 23b of fragments are imbedded or sheathed within the plastic front wall 22b.

The fragments 23 need not be cubical or even prismatic. For example, as shown in Fig. 11, they may be made spherical. As in the case of the Fig. 3 embodiment, it is still desirable to make the contour of the face slightly concave at the extremities, as shown at 23c, in order to inhibit peripheral dispersion of the elements.

The operation of the weapon is substantially as follows: The housing 21 is preferably placed unobtrusively in front or to the side of a combat line defense post.

5

The forward face 22 of the weapon is pointed in the direction from which a mass attack of enemy infantry is most likely to occur. The fuse line 35 is then run to the defensive post and placed under the control of a defensive infantryman.

Upon a mass infantry attack, at the propitious moment, the explosive is detonated and the force of the explosive impels the elements or fragments 23 forwardly with devastating and highly lethal effect. The explosive is substantially unconfined to the rear and to the side by virtue of the frangible nature of the rear and edge walls of the housing 21, and the only danger to personnel at the rear and sides of the weapon is from blast. Since this rapidly attenuates with distance, defense personnel may be located relatively close to the weapon, as long as they remain to the rear or side. The intrinsic inertia of the explosive is sufficient to direct a large portion of the explosive force in a forward direction, thus impelling the fragments forwardly and covering a large forward area with devastating effect.

A bank of such weapons may be placed close together under the successive control of the defensive infantrymen, so that even if successive waves of attackers advance, the weapons may be successively detonated to stop such attacks.

A typical weapon has been constructed and thoroughly tested in accordance with the present invention, having a height of  $3\frac{1}{2}$  inches, a width of 9 inches, and a thickness of  $1\frac{1}{2}$  inches in the center and 2 inches around the edges. The convexity of the weapon in a horizontal plane, as shown in Fig. 3, was such as to encompass a horizontal spread of  $50^\circ$  to  $60^\circ$ , and the vertical spread as shown in Fig. 4 was about  $20^\circ$ . The total weight of the weapon was about  $2\frac{1}{2}$  pounds, employing  $\frac{3}{16}$  inch steel cubes as the fragments or elements 23. The back and edge walls and the front wall (exclusive of course of the fragments 23) was composed of a fiberglass-reinforced plastic. Within the named spread, its effective wounding probability is almost 100% within a distance of 120 feet; and its instantaneous kill probability is 100% within 80 feet. No danger to an exposed user of the weapon is incurred outside of a radius of 15 feet to the sides and rear.

The explosive 27 may be any high explosive having a rapid detonation velocity and which functions through a detonation rather than ignition. Propellants such as black powder are not satisfactory, because in order to achieve an explosion, propellants require confinement; and this is the antithesis of the principle under which the present invention operates. That is, it is important in the present invention that the explosive 27 be housed to the rear and sides thereof in a casing which is made of light weight, low density, frangible material, so that substantially the only danger to personnel at the rear and sides of the weapon is from pure blast rather than from any fragments. Since the rear and side walls of the housing must be readily frangible, it follows that the explosive 27 is substantially unconfined, the forward force applied to the fragments 23 coming from the inertia of the explosive itself, as explained hereinbefore.

While the instant invention has been shown and described herein in what is conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention which is therefore not to be limited to the details disclosed herein, but is to be accorded the full scope of the claims.

What is claimed is:

1. Anti-personnel fragmentation weapon comprising: a housing having a front wall, a back wall substantially parallel thereto, a top edge wall, bottom edge wall and side edge walls, said housing being relatively shallow in depth from said front wall to said back wall, only said front wall including a plurality of elements made of relatively hard, heavy and infrangible material, the remain-

6

ing walls of said housing being relatively thin, light and frangible, explosive within said housing substantially filling the same, and means for receiving a detonator within said housing.

2. Anti-personnel fragmentation weapon comprising: a housing having a front wall, a back wall, substantially parallel thereto and edge walls, said housing being relatively shallow in depth from said front wall to said back wall, only said front wall including a plurality of elements made of relatively hard, heavy and infrangible material packed together closely across the face of said front wall to minimize escape of high-pressure gas resulting from detonation of an explosive within the housing, the remaining walls of said housing being relatively thin, light and frangible, explosive within said housing substantially filling the same, and means for receiving a detonator within said housing.

3. Anti-personnel fragmentation weapon comprising: a housing having a generally convexly cylindrical front wall with the axis of the cylinder being vertical and disposed appreciably behind said housing, a back wall substantially parallel to said front wall, and edge walls, said housing being relatively shallow in depth from said front wall to said back wall, only said front wall including a plurality of elements made of relatively hard, heavy and infrangible material, the remaining walls of said housing being relatively thin, light and frangible, explosive within said housing substantially filling the same, and means for receiving a detonator within said housing.

4. Anti-personnel fragmentation weapon comprising: a housing having a generally convexly cylindrical front wall with the axis of the cylinder being vertical and disposed appreciably behind said housing, a back wall substantially paralleling said front wall, and edge walls, said housing being relatively shallow in depth from said front wall to said back wall, only said front wall including a plurality of elements made of relatively hard, heavy and infrangible material, the remaining walls of said housing being relatively thin, light and frangible, explosive within said housing substantially filling the same, and means for receiving a detonator within said housing at one end thereof.

5. Anti-personnel fragmentation weapon comprising: a housing having a front wall, a back wall substantially parallel thereto, and edge walls, said housing being relatively shallow in depth from said front wall to said back wall, only said front wall including a plurality of elements made of relatively hard, heavy and infrangible material, the remaining walls of said housing being relatively thin, light and frangible, explosive within said housing substantially filling the same, and means for receiving a detonator within said housing, the peripheral portions of said front wall embodying means for preventing undue peripheral dispersions of said elements.

6. Anti-personnel fragmentation weapon comprising: a housing having a front wall, a back wall substantially parallel thereto, and edge walls, said housing being relatively shallow in depth from said front wall to said back wall, only said front wall including a plurality of elements made of relatively hard, heavy and infrangible material, the remaining walls of said housing being relatively thin, light and frangible, explosive within said housing substantially filling the same, and means for receiving a detonator within said housing, the peripheral portions of said front wall being of concave shape for preventing undue peripheral dispersion of said elements.

7. Anti-personnel fragmentation weapon comprising: a housing having a front wall, a back wall paralleling said front wall, a top edge wall, a bottom edge wall and side edge walls, said housing being relatively shallow in depth from said front wall to said back wall, only said front wall including a plurality of elements made of relatively hard, heavy and infrangible material, the remaining walls of said housing being relatively thin,

light and frangible, explosive within said housing substantially filling the same, and means located adjacent said front wall for receiving a detonator within said housing, said detonator receiving means being positioned within said explosive and contiguous to said front wall. 5

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